



3
YEARS
WARRANTY

ROHS
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REACH
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Automobile



Automation



Datacom



IPC



Industry



Measurement



Telecom



Boat



Charger



Medical



PV



Railway



NON
-isolation

NO
Min. Load
Required

OCP

OTP

SCP

PART NUMBER STRUCTURE

HSR01 -

Series Name

48

Input
Voltage
(VDC)

S

Output
Quantity

05

Output
Voltage
(VDC)

-

A

Mounting
Options

* See table as below

S:Single

3P3:3.3

05:5

6P5:6.5

09:9

12:12

15:15

24:24

⌋ : Vertical Mounting

A: Horizontal Mounting

TECHNICAL SPECIFICATION All specifications are typical at nominal input, full load and 25°C unless otherwise noted

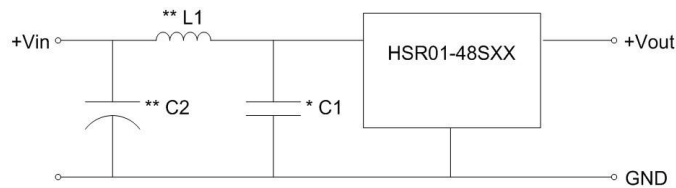
Model Number	Input Range VDC	Output Voltage VDC	Output Current @Full Load A	Input Current @ No Load mA	Efficiency		Maximum Capacitor Load μF
					24Vin %	48Vin %	
HSR01-48S3P3	9 ~ 72	3.3	1	10	82.5	78.0	2400
HSR01-48S05	9 ~ 72	5	1	10	86.5	82.5	1580
HSR01-48S6P5	9 ~ 72	6.5	1	10	88.0	85.0	1200
HSR01-48S09	14 ~ 72	9	1	10	90.0	87.5	880
HSR01-48S12	17 ~ 72	12	1	15	92.5	90.5	660
HSR01-48S15	21 ~ 72	15	1	15	93.0	90.0	530
HSR01-48S24	33 ~ 72	24	0.7	15	-	92.0	330

INPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating input voltage range	HSR01-48S3P3	9	48	72	VDC
	HSR01-48S05	9	48	72	
	HSR01-48S6P5	9	48	72	
	HSR01-48S09	14	48	72	
	HSR01-48S12	17	48	72	
	HSR01-48S15	21	48	72	
	HSR01-48S24	33	48	72	
Start up time	Constant resistive load With maximum capacitor	Power up		25	ms

Input filter

Capacitor type



* It's recommended to equip the external input capacitors at the input of the module. Typical value is 2.2μF/100V.

** If the input will be switched electromechanically, the input should install an external C2 and L1 to avoid voltage transient.

C1	2.2μF/100V
C2	33μF/100V E/C
L1	4.7μH

OUTPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Voltage accuracy		-2.0		+2.0	%
Line regulation	Low Line to High Line at Full Load	-0.5		+0.5	%
Load regulation	0% to 100% of Full Load	-0.6		+0.6	%
Ripple and noise	Measured by 20MHz bandwidth				
	With a 10μF/25V X7R MLCC With a 4.7μF/50V X7R MLCC		50 75		mVp-p
Temperature coefficient		-0.02		+0.02	%/°C
Dynamic load response	50% load step change				
	With a 10μF/25V X7R MLCC		90	180	mV
	With a 4.7μF/50V X7R MLCC		125	250	mV
			150	250	us
Over load protection	% of Iout rated		180		%
Short circuit protection		Continuous, automatic recovery			

GENERAL SPECIFICATIONS

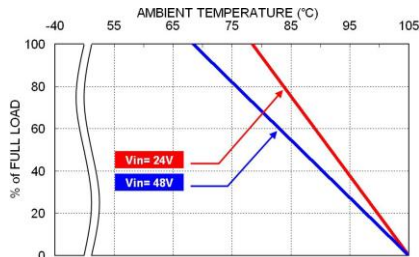
Parameter	Conditions		Min.	Typ.	Max.	Unit
Isolation voltage	1 minute	Input (Output) to Case	500			VDC
Switching frequency	Nominal input, Full Load	48S3P3	143	190	238	kHz
		48S05	150	200	250	
		48S6P5	188	250	313	
		48S09	225	300	375	
		48S12	263	350	438	
		48S15	300	400	500	
		48S24	413	550	688	
Safety meets	IEC/ EN/ UL62368-1					
Case material	Metal					
Potting material	Epoxy (UL94 V-0)					
Weight	5.5g (0.194oz)					
MTBF	MIL-HDBK-217F, Full load					8.215 x 10 ⁶ hrs

ENVIRONMENTAL SPECIFICATIONS

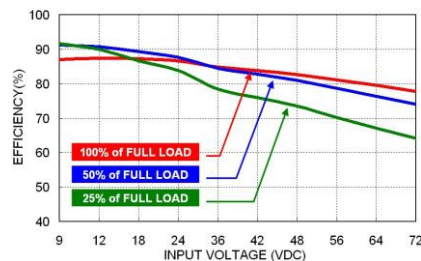
Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating ambient temperature	With derating		-40		+105	°C
Maximum case temperature					105	°C
Over temperature protection	Internal IC junction			165		°C
Storage temperature range			-55		+125	°C
Thermal impedance				35		°C/W
	*Thermal test condition with vertical direction mounted on a PCB with 1oz copper and 0.8mm thickness.					
Thermal shock						MIL-STD-810F
Shock						MIL-STD-810F
Vibration						MIL-STD-810F
Relative humidity						5% to 95% RH

CAUTION: This power module is not internally fused. An input line fuse must always be used.

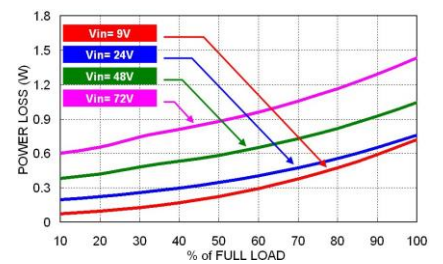
CHARACTERISTIC CURVE



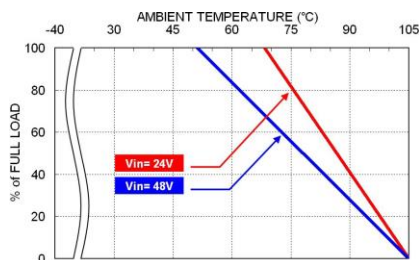
HSR01-48S05 Derating Curve



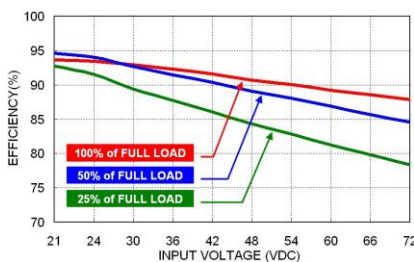
HSR01-48S05 Efficiency vs. Input Voltage



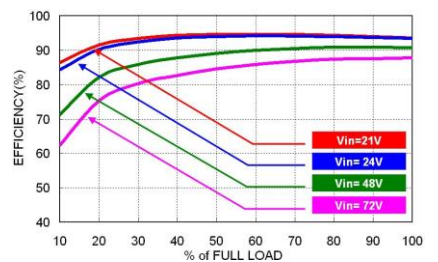
HSR01-48S05 Efficiency vs. Output Load



HSR01-48S15 Derating Curve



HSR01-48S15 Efficiency vs. Input Voltage



HSR01-48S15 Efficiency vs. Output Load

FUSE CONSIDERATION

This power module is not internally fused. An input line fuse must always be used.

This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.

To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

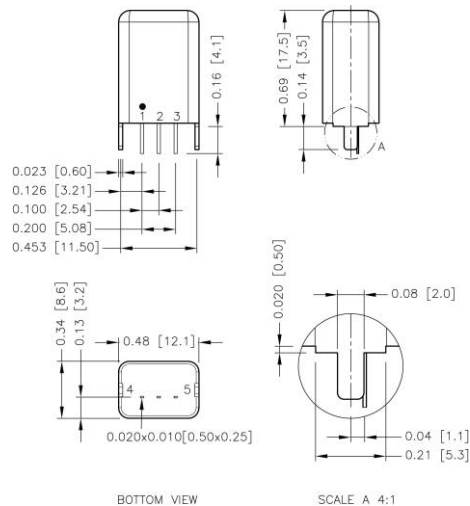
The input line fuse suggest as below :

Model	Fuse Rating (A)	Fuse Type
HSR01-48S3P3	1.0	Slow-Blow
HSR01-48S05, HSR01-48S24	1.25	Slow-Blow
HSR01-48S6P5, HSR01-48S09, HSR01-48S12, HSR01-48S15	1.6	Slow-Blow

The table based on the information provided in this datasheet on inrush energy and maximum DC input current at low V_{in} .

MECHANICAL DRAWING

Standard type: Vertical mounting

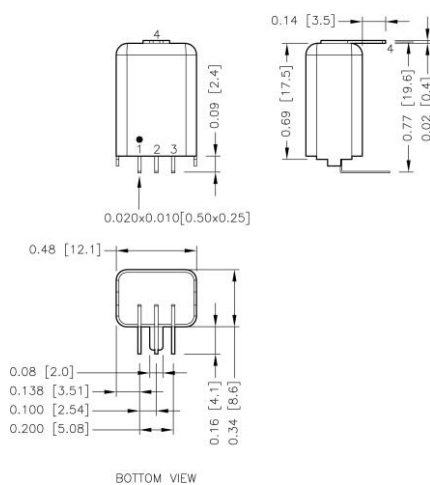


PIN CONNECTION

PIN	DEFINITION
1	+Vin
2	GND
3	+Vout
4	CASE PIN
5	CASE PIN

1. All dimensions in inch [mm]
2. Tolerance :x.xx±0.02 [x.x±0.5]
x.xxx±0.010 [x.xx±0.25]
3. Pin dimension tolerance ±0.004[0.10]

Suffix-A: Horizontal mounting



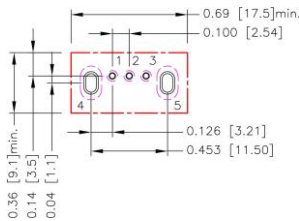
PIN CONNECTION

PIN	DEFINITION
1	+Vin
2	GND
3	+Vout
4	CASE PIN

1. All dimensions in inch [mm]
2. Tolerance :x.xx±0.02 [x.x±0.5]
x.xxx±0.010 [x.xx±0.25]
3. Pin dimension tolerance ±0.004[0.10]

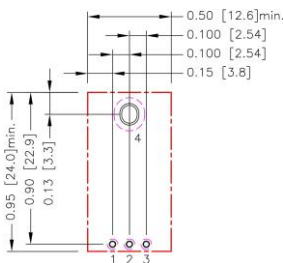
RECOMMENDED PAD LAYOUT

Standard type



All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.2.3:Ø0.031[0.80]
Through hole 4.5:Groove R0.031[0.80]L0.110[2.80]
Top view pad 1.2.3:Ø0.039[1.00]
Top view pad 4.5:Groove R0.043[1.10]L0.134[3.40]
Bottom view pad 1.2.3:Ø0.063[1.60]
Bottom view pad 4.5:Groove R0.063[1.60]L0.201[5.10]

Suffix-A:



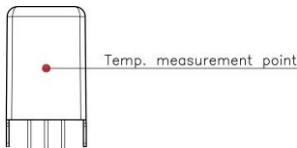
All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.2.3:Ø0.031[0.80]
Through hole 4:Groove R0.045[1.15]L0.106[2.70]
Top view pad 1.2.3:Ø0.039[1.00]
Top view pad 4:Groove R0.057[1.45]L0.130[3.30]
Bottom view pad 1.2.3:Ø0.063[1.60]
Bottom view pad 4:Groove R0.091[2.3]L0.197[5.00]

THERMAL CONSIDERATIONS

The power module operates in a variety of thermal environments. However, sufficient cooling should be provided to help ensure reliable operation of the unit. Heat is removed by conduction, convection, and radiation to the surrounding Environment. Proper cooling can be verified by measuring the point as the figure below. The temperature at this location should not exceed "Maximum case temperature". When Operating, adequate cooling must be provided to maintain the test point temperature at or below "Maximum case temperature". You can limit this Temperature to a lower value for extremely high reliability.

The unit will shutdown if the internal IC junction exceeds 165°C (typical), but the thermal shutdown is not intended as a guarantee that the unit will survive temperature beyond its rating. The module will automatically restarts after it cools down.

- Thermal test condition with vertical direction by natural convection (20LFM) and mounted on a PCB with 1oz copper and 0.8mm thickness.



FRONT VIEW